

(19)



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(11)

EP 0 816 100 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.01.1998 Bulletin 1998/02

(51) Int Cl.⁶: B41J 2/175

(21) Application number: 97304353.2

(22) Date of filing: 20.06.1997

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE

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(30) Priority: 28.06.1996 US 673298

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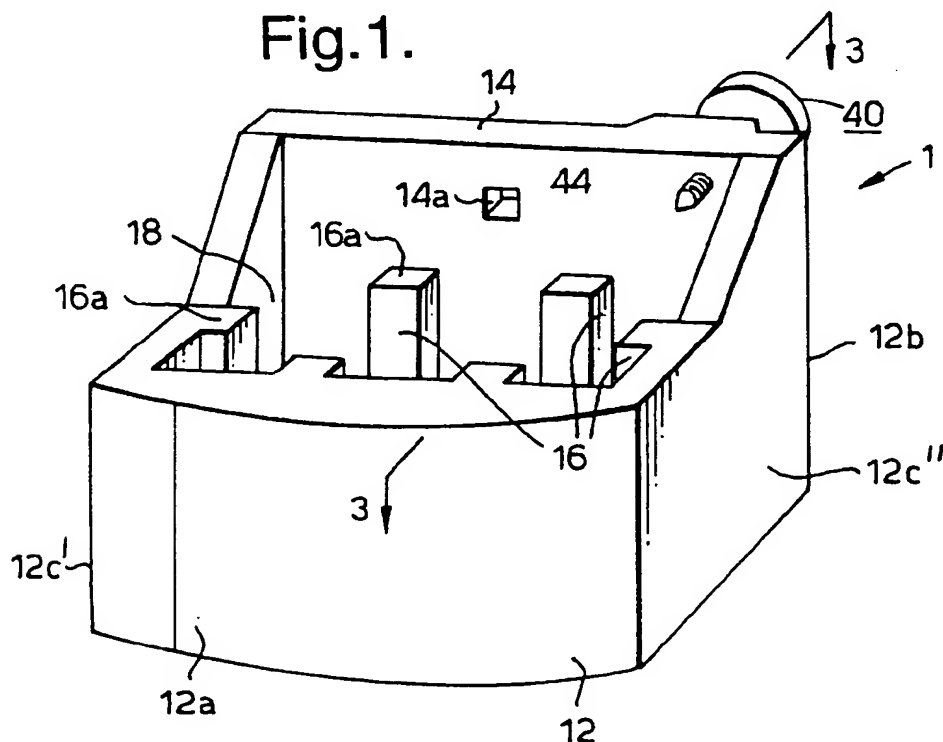
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(54) Method and apparatus for refilling a print cartridge

(57) An apparatus and method for refilling ink into a used, empty ink cartridge for ink-jet printers using an ink refill station (10) and an ink refill adapter (50), the ink refill station (10) accommodating the cartridge so that the head section of the cartridge is separated by a pressing or shearing force applied by a threaded screw (40)

that is provided in the refill station, and the ink refill adapter being placed on the main section of the cartridge after the head section is removed so that ink is transferred from an ink container to the main section of the cartridge via needles (62) provided in the ink refill adapter (50).

Fig.1.



EP 0 816 100 A2

Description

The present invention relates to an apparatus for refilling an ink into an ink-cartridge and more particularly to an apparatus for refilling color inks into a used, empty color ink cartridge used for, for instance, ink-jet printers.

In order to protect the environment and save energy, it is today's common practice to reuse used printer ink cartridges. In other words, when an ink cartridge designed for use in computer printers, particularly in ink-jet printers, runs out of ink, it is refilled with ink so that the thus refilled ink cartridge is installed back in the printers. This practice is currently done not only for single color, usually black, ink cartridges but also for color ink cartridges.

Figure 12 shows a typical color ink cartridge. The cartridge 1 is comprised of a main section 1a and a head section 1b. The head section 1b is attached to the main section 1a via welding, gluing, etc. at the flange 1a' and 1b' of the main section 1a and head section 1b'. The main section 1a contains inside thereof three ink reservoirs (not shown) for red, blue and yellow inks, respectively.

When this type of color ink cartridge is refilled with ink, holes are opened in the top surface of the head section 1b using a drill, for instance, so that ink is transferred from ink containers (bottles or tubes) into the cartridge 1 through the thus opened holes. Another way to refill the cartridge with ink is to remove the head section 1b from the main body 1a. When the head section 1b is separated as shown in Figure 10, openings 2 of the ink reservoirs installed in the main section 1b of the cartridge 1 are exposed so that ink is transferred from ink containers (not shown) into the ink reservoirs. A vice is the most often used tool for removing the head section 1b from the main section 1a. The head section 1b can be removed using a principle of leverage which is seen in cap openers.

However, these devices for removing the head section 1b are used for only separating the head section 1b from the main section 1a and have no other use. In addition, when a drill is used for opening the ink transfer holes in the head section 1b, since the locations of the ink reservoirs in the main section 1a of the ink cartridge are not recognizable from the outside, hole making is not easy, thus making the refilling of ink difficult as a whole.

Accordingly, the aim of embodiments of the present invention is to provide an apparatus for refilling color ink cartridges that is free of the problems seen in conventional ink refilling apparatuses.

Another aim of embodiments of the present invention is to provide an apparatus which is used for refilling color ink cartridges with a simple structure.

Still another aim of embodiments of the present invention is to provide an apparatus for refilling color ink cartridges that can be used easily without contaminating the surrounding areas.

The above and other aims may be accomplished by a unique structure for an ink refilling apparatus for refilling color inks into an empty color ink cartridge which comprises a combination of an ink refill station and an ink refill adapter; the refill station being substantially a rectangular box with open top and bottom ends and having an upwardly extended side plate which has a pushing screw, the ink refill adapter comprising a base plate which is provided with a plurality of ink container holders having ink transfer needles therein which connects ink containers to openings of the ink reservoirs provided in the main section of the ink cartridge.

With the structure above, an empty color ink cartridge with the ink therein completely used may be set in the refill station with the head section of the cartridge positioned next to the upwardly extended side plate; then the pushing screw may be turned so that the tip end of the pushing screw pushes the head section of the cartridge, thus separating the head section from the main section of the cartridge via the pressing force applied by the pushing screw. When the head section is thus removed, the ink cartridge or the main section of the cartridge may remain inside the ink refill station, standing vertically; and the ink refill adapter may be placed on the main section of the cartridge so that one end of each one of the ink transfer needles of the ink refill adapter is brought into the ink reservoir; and then the ink outlet of an ink container (or tube) may be connected to another end of one of the ink transfer needles, thus transferring the ink from the ink containers into the ink reservoirs of the ink cartridge via the ink transfer needles.

The pushing screw may be provided in plural numbers so that the pressing force can be applied evenly on the head section of the ink cartridge.

For a better understanding of the present invention and as to how the same may be carried into effect, reference will now be made by way of example to the accompanying drawings in which:

Figure 1 is a perspective view of the ink refill station according to one embodiment of the present invention;

Figure 2 is a schematic view showing the ink cartridge placed on the ribs of the ink refill station of Figure 1;

Figure 3 shows a cross section taken along the line 3-3 in Figure 1;

Figure 4 is a top view of the ink refill station according to another embodiment of the present invention; Figure 5 shows an ink refill adapter according to one embodiment of the present invention,

Figure 6 is a side view thereof;

Figure 7 illustrates a method of snapping off of the head section from the main section of the cartridge embodying the present invention;

Figure 8 is a schematic view showing the ink cartridge placed on the ribs of the ink refill station of

center an ink transfer needle 62. The needles 62 penetrate the base plate 52 of the ink refill adapter 50, thus having, as best seen in Figure 10, upper sections 62a and lower sections 62b. Each one of the needles 62 has a central through hole 62c that extends all the way from the upper end to the bottom end of the needle 62, and both ends of each one of the needles 62 are formed pointed.

The ink refill adapter 50 is further provided with a pair of side walls 66 and a rear wall 68 which extend upwardly from the side edges and rear edge of the base plate 52, respectively. The rear wall 68 is, as best seen in Figure 6, provided with a positioning projection 68a. The positioning projection 68a projects from the outer or back surface of the rear wall 68 and has a size that can snugly fit in the positioning opening 14a formed in the extended plate section 14 of the main box 12.

With the structures described above, a used and empty color ink cartridge 1, as shown in Figure 12, is placed inside the cartridge holding space 18. It is preferable to put a safety band around the refill station 10 and over the ink cartridge so as to secure the cartridge inside the cartridge holding space 18. When main section 1a of the cartridge 1 is completely placed inside the cartridge holding space 18, the flange 1a' of the main section 1a of the cartridge 1 rests on the top surfaces 16a of the ribs 16 of the main section body 12 as shown in Figure 2.

Then, the pushing screw 40 is turned by hand in one direction so as to advance the tip end 44a of the screw 40 to the head section 1b of the cartridge 1. The advanced tip end 44a of the screw comes into contact with the side or the upper area of the head section 1b; and when the screw 40 is further turned, the tip end 44a pushes off the head section 1a from the cartridge main section by the advancing movement of the pushing screw 40. With this pushing force of the screw 40, the head section 1b glued to the main section is separated as shown by the dotted line in Figure 2.

In case the head section 1b is not completely separated from the main section 1a, the cartridge 1 is removed from the cartridge holding space 18, and the head section 1b of the cartridge 1 is brought between the slanted surfaces 16c of the bottom area of the ribs 16 after the main box 12 is set sideways as shown in Figure 7. After this, a pressing force F is applied to the main section 1a of the cartridge 1 so that the head section 1b held between the slanted surfaces 16c of the ribs 16 is snapped off from the main section 1a, thus separating the head section 1b from the main section 1a.

In the embodiment shown in Figure 4, the extended plate section 14 of the main box 12 has a pair of screws 40' and 40", each having a pointed end 44a'; and as shown in Figure 8, these screws 40' and 40" are provided, height-wise in the main box 12, so that when the screws 40' and 40" are rotated, the pointed ends 44a' advance, come into contact with and penetrate into the seamed area between the glued flange 1a' and 1b' of

the main section 1a and head section 1b, where the main section 1a and the head section 1b are attached together, so that the pointed end 44a' applies a shearing force to the seamed area, thus separating the head section 1b from the main section 1a. When the two screws 40' and 40" are turned, it is preferable to turn them by turns so that shearing force can be applied evenly onto two (2) points of the seamed area of the cartridge 1. In this embodiment as shown in Figure 4, however, only one screw (either 40' or 40") that has a pointed tip end can be used. In this case, such a single pointed-end screw is provided in one of two threaded holes 30' and 30" or in a threaded hole 30" which is provided above the rib 16" located at the center of three (3) ribs 16 formed on the rear wall 12c.

During the above-described head separation process using the screw or screws, it is possible to take out the cartridge out of the cartridge holding space 18 and then put it back in the space 18 after turning around the cartridge so that the other side of the head section 1b or the seamed area faces the tip end(s) of the screw(s).

When the head section 1b is thus separated from the main section 1a by the screw(s) 40, the main section 1a remains upright inside the cartridge holding space 18. When the head section 1b is removed by way of the method shown in Figure 7, the main section 1a having no head section 1b thereon is put back in the cartridge holding space 18 (by hand) so that the flange 1a' is on the upper surfaces 16a of the ribs 16.

After the main section 1a is thus set upright in the cartridge holding space 18, the pushing screw(s) 40 is turned in another direction so that the tip end 44a is retrieved from above the cartridge holding space 18.

Then, the ink refill adapter 50 is placed on the main section 1a of the ink cartridge 1 and pressed downward, so that the pointed ends of the lower portions 62b of the ink transfer needles 62 are brought into the ink reservoirs inside the main section 1a as shown in Figure 9.

After the needles 62 are brought into the ink reservoirs, an ink container 100 is set into one of the ink container holders 54 as shown in Figure 10. In other words, the ink-outlet 100a of the ink container 100 is pushed into the pointed end of the upper portion 62a of the ink transfer needle 62 so that the pointed end of the upper portion 62a penetrates the ink outlet 100a into the ink container 100. By squeezing the ink container 100, the ink inside the ink container 100 is transferred into the reservoir through the central hole 62c of the needle 62. This ink transfer will be done for three times so that all of three reservoirs are filled with red, blue and yellow ink if all of the color ink has been used up. In deed, only one or two ink can be refilled after determining which color (s) should be refilled.

After the ink filling is thus completed, the head section 1b is put back on the main section 1a and secured thereon by an adhesive tape so that the refilled cartridge 1 is ready to be installed back in a printer.

Figure 11 shows a different type of ink refill adapter

vided with at least one separation means for separating said head section from said main section of said cartridge.

9. An apparatus according to Claim 8, wherein said separation means is a threaded screw provided in a threaded hole formed in an extended plate section formed on said box.
10. An apparatus according to Claim 8 or 9, wherein a tip end of said at least one separating means is provided so as to come into contact with an upper end area of said head section of said cartridge
11. An apparatus according to Claim 8, 9 or 10, wherein a tip end of said at least one pressing means is provided so as to come into contact with a seamed area where said head section and said main section of said cartridge are attached together.
12. An apparatus according to any of Claims 8 to 11, further comprising slanted surfaces provided on said ribs so that said main section of said ink cartridge is held between said slanted surfaces.
13. A method for refilling ink into an ink cartridge which comprises a main section having an ink reservoir therein and a head section attached to said main section, said method comprising the steps of:

placing said ink cartridge into an empty space of an ink refill station which is substantially a box having said empty space therein so as to accommodate said main section of said cartridge in said empty space, said ink refill station being provided with a plurality of longitudinal ribs formed on an inner surface that defines said empty space and provided with at least one separation means;
operating said separation means so as to come into contact with said cartridge, thus separating said head section from said main section so that said main section of said ink cartridge remains in said ink refill station;
placing an ink refill adapter on a top end of said main section of said ink cartridge which is in said ink refill station so that one end of an ink transfer means provided in said ink refill adapter is inserted in an ink reservoir of said main section of said ink cartridge; and
connecting an outlet of an ink container to another end of said ink transfer means so that ink contained in said ink container is transferred from said ink container into said ink reservoir.

14. A method according to Claim 13, further comprising a step comprising holding said head section of said ink cartridge between slanted surfaces which are

formed on said longitudinal ribs, pressing said main section of said ink cartridge so as to separate said head section from said main section, and then placing said main section of said ink cartridge in said ink refill station, said step being taken before said step of placing said ink refill adapter on said top end of said main section of said ink cartridge.

15. A method according to Claim 13 or 14, wherein a tip end of said separating means comes into contact with an upper end area of said head section of said cartridge.
16. A method according to Claim 13, 14 or 15, wherein a tip end of said pressing means comes into contact with and penetrates into a seamed area where said head section and said main section of said cartridge are attached together.

Fig.4.

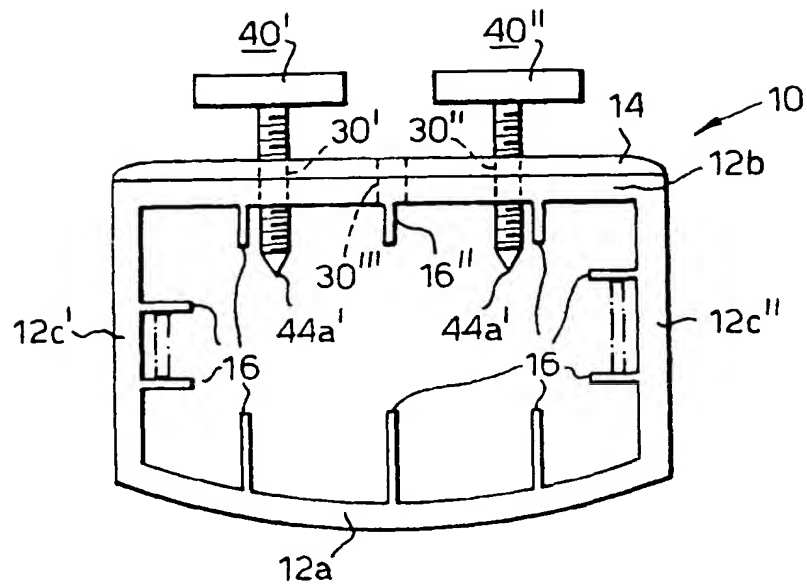


Fig.5.

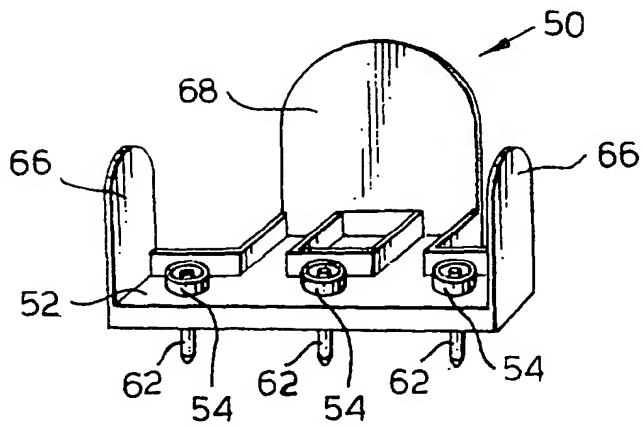


Fig.6.

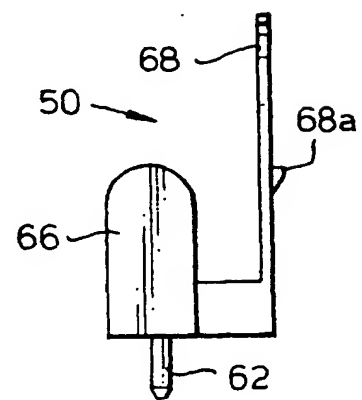


Fig.9.

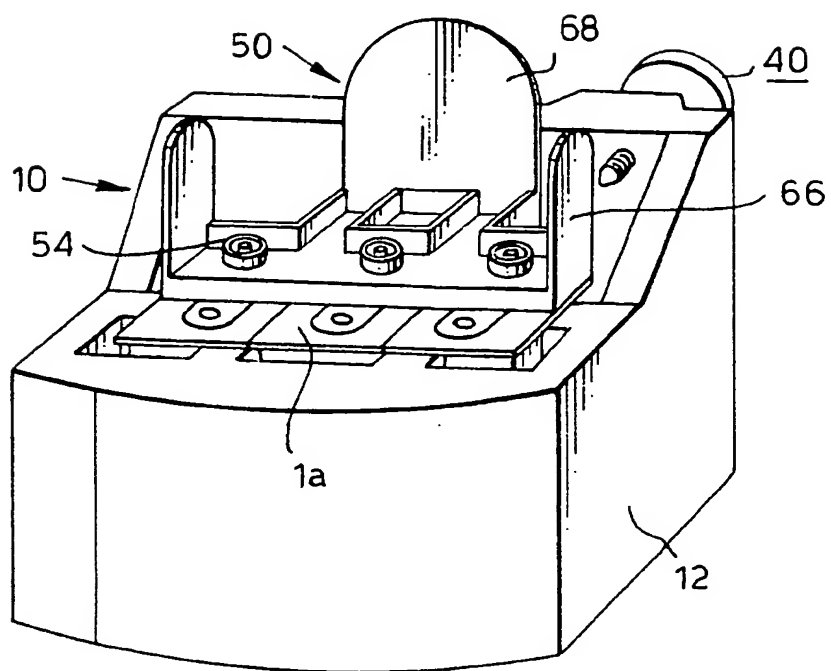


Fig.10.

